



SURVEY ON THE KNOWLEDGE AND SKILLS REQUIRED BY CAMBODIAN STAKEHOLDERS TOWARDS A TRANSITION TO A GREEN ECONOMY

November 2020



Co-funded by the
Erasmus+ Programme
of the European Union



UNIVERSITÉ DE NANTES



Contributors

Project Team:

Camilo Gonzales, Master EEET parcours
Conduite de Projets en Développement
Durable Environnement-Mer-Energies IAE
Nantes 2019/2020

Dr. Lionel LEMIALE, Université de Nantes –
France

Pr. Claire GAUZENTE, Université de Nantes
– France



UNIVERSITÉ DE NANTES

Acknowledgement:

This study was made for the GREENCAP
Project, project number 609553-EPP-1-
2019-1-FR-EPPKA2-CBHE-JP, co-funded by
the Erasmus+ programme of the European
Union.

Disclaimer:

The European Commission's support for the
production of this publication does not
constitute an endorsement of the contents,
which reflect the views only of the authors,
and the Commission cannot be held
responsible for any use which may be made
of the information contained therein.



Co-funded by the
Erasmus+ Programme
of the European Union

EXECUTIVE SUMMARY

Problems such as climate change and environmental degradation greatly affect the economy, the labour market, and employment, in situations such as damage to business assets and infrastructure, occupational health and safety, and labour productivity (ILO, 2016a). Measures or actions to fight these problems open the door to a "*Green transition*". Nevertheless, the process towards a *green transition* will not only change the characteristics of employment, but it will also create new markets, new activities, and transform businesses, which will require to invest in training, and in the reskilling of the workforce skills to reduce the risk of increased unemployment, poverty, inequality and to respond to the new labor market needs. However, to achieve adequate planning and policy management for a more environmentally friendly model, investments in new technologies, products, services, and infrastructure are required.

Many countries particularly developing countries need support to finance, identify and adopt the creation of objectives and best practices that enable and facilitate socio-economic development with long-term environmental sustainability goals. For this reason, and due to an increase in the *European Union's* (EU) relations and cooperation with *The Association of Southeast Asian Nations* (ASEAN) and the framework of the *Erasmus+* program, in the fields of education, training, and youth, the GREENCAP project offers support to Higher Education Institutions in Cambodia to reform their curriculum for green growth by promoting closer relations between universities and industry, and so that these institutions can produce skilled labor according to the demand of Cambodian stakeholders. For this reason, the objective of this survey is to analyze the knowledge and skills required by Cambodian Stakeholders towards a transition to a green economy.

In this regard, the identification of the main skills needed was carried out. The results obtained using the Q methodology and regarding the opinions of stakeholders', three groups were identified: The first one was "*The Environmental management stakeholders*", who considered as important *Innovation skills* (Statement 6), *Networking*, *IT*, and *language skills*. The second



group was *"The Environmentally conscious stakeholders"*, who considered as important "Knowledge in environmental impacts assessment" and *"Knowledge in management of natural resources"*. The Third group was "The *Strategic and innovative stakeholders*" who considered as important "Strategic and leadership skills" and, finally, *"Technical skills"*.

Keywords: *Green Jobs, Green Transition, Green Skills, Q Methodology, Cambodia.*



TABLE OF CONTENTS

| | |
|---|-----------|
| EXECUTIVE SUMMARY..... | 2 |
| LIST OF TABLES | 5 |
| LIST OF FIGURES | 5 |
| THE GREENCAP PROJECT..... | 6 |
| INTRODUCTION | 9 |
| 1. THE GREEN JOBS AND GREEN SKILLS | 11 |
| 1.1 THE CONCEPT OF GREEN JOBS AND GREEN SKILLS | 12 |
| 1.2 MEASURING GREEN JOBS | 15 |
| 1.2.1 Inventories and Surveys..... | 15 |
| 1.2.2 The industry- output approach and the process- occupational approach. | 16 |
| 1.2.3 The Input-Output Method and Social Accounting Matrices (SAM) to estimate the employment effects in a green economy. | 16 |
| 1.3 THE EMPLOYMENT EFFECTS OF GREENING THE ECONOMY AND THE SKILLS NEEDED FOR GREEN JOBS. | 18 |
| 1.3.1 ENERGY SECTOR | 19 |
| 1.3.2 AGRICULTURE SECTOR | 20 |
| 1.3.3 CIRCULAR ECONOMY..... | 21 |
| 1.4 THE SKILLS NEEDED FOR GREEN JOBS: THE CHALLENGE FOR A GREEN TRANSITION..... | 22 |
| 1.5 GENERAL OVERVIEW OF GREEN JOBS AND GREEN SKILLS IN CAMBODIA..... | 25 |
| 1.5.1 CAMBODIA- General Country Context | 26 |
| 1.5.2 The Environment and Natural Capital Management in Cambodia. | 27 |
| 1.5.3 The Environmental Issues and Climate Change | 28 |
| 1.5.4 Green transition in Cambodia: National Environment Strategy and Action Plan: 2016-2023. | 29 |
| 1.5.5 Scenarios for Green Transition in Cambodia: Description of Agricultural and Renewable Energy sector..... | 30 |
| 2. Q METHODOLOGY: STAKEHOLDER ANALYSIS TO DEFINE EXISTING AND FUTURE GREEN SKILLS REQUIREMENT TOWARDS A GREEN TRANSITION IN CAMBODIA. | 33 |
| 2.1 THEORETICAL FRAMEWORK OF THE Q METHODOLOGY..... | 34 |
| 2.2 Q METHODOLOGY ELEMENTS AND SURVEY DESIGN | 35 |
| 2.2.1 The Q methodology elements..... | 35 |
| 2.2.2 The design and application of the survey..... | 35 |
| 2.3 FACTOR CONSTRUCTION | 38 |
| 2.3.1 Choice of factors..... | 38 |
| 2.3.2 Flagging | 39 |
| 2.3.3 Constitution of the synthetic Q-sort..... | 40 |
| 2.4 PROCESSING AND ANALYSIS OF RESULTS | 41 |
| 2.4.1 Z-scores analysis | 41 |
| 2.4.2 Analysis of what distinguishes each factor and builds consensus..... | 42 |
| 2.5 FACTORS INTERPRETATION | 43 |
| 2.5.1 Idealized Q-Sort for Factor 1. Strategic and innovative stakeholders | 43 |
| 2.5.2 Idealized Q-Sort for Factor 2. Environmentally conscious stakeholders | 44 |



| | |
|--|-----------|
| 2.5.3 Idealized Q-Sort for Factor 3 Environmental management stakeholders..... | 45 |
| CONCLUSIONS | 47 |
| GLOSSARY | 49 |
| BIBLIOGRAPHY | 51 |
| APPENDICES | 53 |
| <i>Appendix 1: List of statements for the Q Methodology survey.....</i> | <i>53</i> |
| <i>Appendix 2: Grid for classifying the statements</i> | <i>54</i> |

LIST OF TABLES

| | |
|--|----|
| Table 1 The Main Skills Challenges Towards A Green Transition..... | 24 |
| Table 2 Unrotated factor matrix | 38 |
| Table 3 Cumulative Communalities Matrix..... | 39 |
| Table 4 Factor Matrix with Defining Sorts Flagged | 40 |
| Table 5 Factor Scores with Corresponding Ranks | 41 |
| Table 6 Factor Q-sort Values for Statements sorted by Consensus vs. Disagreement | 42 |

LIST OF FIGURES

| | |
|--|----|
| Figure 1 Idealized Q-Sort for Factor 1 | 43 |
| Figure 2 Idealized Q-Sort for Factor 2 | 44 |
| Figure 3 Idealized Q-Sort for Factor 3 | 45 |

THE GREENCAP PROJECT

The **GREENCAP** project is an ERASMUS+ capacity building project for higher education funded by the European Union. It was launched in January 2020 and will last 3 years. The main objective of the **GREENCAP** project is to support Cambodia's path towards green growth and sustainable development of the economy by promoting cooperation between companies and universities. This was created mainly because a global debate has been generated about the balance that should exist between economic growth and ecological sustainability. Among the most outstanding issues are the reduction of carbon dioxide emissions to minimize the risk of climate change and the over-exploitation of natural resources. These changes may be achieved with strategic policies that allow the development of green economies. With this shift towards green economies, new employment opportunities will be created in the solar industries or pollution monitoring, while other jobs will be shifted between sectors, for example from fossil to renewable energies.

This project works directly with Cambodia since 30% of the population depends on either agriculture or fisheries for their livelihood. However, this country is now in a rapidly developing phase and recently, Cambodia is upgraded from a low-income country to a lower-middle-income country due to its economic growth, which was 6.9% in 2017 (CIA, 2018). However, Cambodian economic growth is often occurring at the expense of environmental assets and overexploitation of natural resources. Realizing the importance of green growth, the Royal Government of Cambodia established the National Council for Sustainable Development (NCSD) by the Ministry of Environment.

The specific objectives of the **GREENCAP** project are described below:

- *To help to better establish strong links between HEIs and the private sector to give practical insights on course curriculum and research, so that universities can produce skilled manpower as per the demand of the private companies.*



- *To help to adopt or create specific courses and diploma (BSc and / MSc) related to green growth given that modernization & internationalization of the courses are urgent need to achieve the Cambodian government NESAP 2016-2023*
- *To help to promote innovative teaching on green development to increase the attractiveness of courses*
- *To discuss a strategy to increase the number of full- time master students*
- *To help to fulfill the gap between Bachelor and Master studies, and also between tertiary and higher secondary education*
- *To help to promote multi-disciplinary approach teaching*
- *To help to promote multidisciplinary researches related to green business or green growth.*
- *To help to create career centers at each university*
- *To help to increase awareness for green higher education among university and school students*
- *To help to create a green platform to match students' skills and stakeholders' needs for green growth and green society.*

GREENCAP has 4 partners that include them:

- **RULE (The Royal University of Law and Economics):** This university has an undergraduate program related to economic development and another program of the same category in tourism and hospitality management, at the master's level they have a business and project management program. Although in these three programs some courses deal with sustainable development, this is not enough. The university needs a new teaching method and an up-to-date green entrepreneurship curriculum is needed.
- **ITC (Institute of Technology of Cambodia):** The **GREENCAP** project seeks to collaborate with this institute in different areas, such as, to train staffs in green curriculum, to send students and teachers to EU HEIs for gathering knowledge on modern teaching style and also conducting quality research in green growth, to create a career forum and

online platform to provide the collective job announcement/consultation opportunity/supporting program opportunity which related to environment and green growth and, to create a joint degree program among partner universities on “Green Environment and Natural Resources Management” which support the strategy of green human resources development.

- **UBB (University of Battambang):** UBB is making an effort to promote green economic development in North-western Cambodia. However, integrating green growth approaches are still challenging at UBB since there is a lack of human resources and expertise. For this reason, **GREENCAP** seeks to provide Advanced Training Courses (ATCs) and study visits in the EU which will greatly influence the quality of graduate programs at UBB which is linked to the sustainable development of Cambodia.
- **NUM (National University of Management):** NUM doesn't have courses in green entrepreneurship although there are many courses and classes in entrepreneurship, for this reason, Through the **GREENCAP** project, staff training will be carried out in the area of green business courses.

As ones of the first activities, **GREENCAP** will provide two up-to-date surveys. The first one will provide useful recommendations about the “green skills” requirement from the private sector's perspective, both at local (Phnom Penh) and national level, with a special focus on tourism, textile, and energy industry, and urban/city development. The second one will provide a survey on student's awareness of green jobs.

In summary, the **GREENCAP** project will answer the needs by enhancing two main pillars: to increase awareness of green business among students and to improve student's employability for existing and future green jobs. Experience of the EU partners on green economy and cooperation between universities and industry will significantly contribute to extensive revision of existing curricula and creating new multidisciplinary tertiary degree programs related to green growth in Cambodia.

INTRODUCTION

In recent years, the world population has increased considerably, which has led to more resources being consumed, more waste being produced and more Greenhouse gases (GHGs) being emitted in production processes that can be absorbed and regenerated by nature. This situation has guided humanity towards environmental unsustainability, environmental degradation, and an increase in global temperature. These facts have led various world actors to develop strategies to mitigate or fight climate change and the environmental degradation.

During the 1970s, which marked the beginning of concern for the environment, the *United Nations* (UN), in the *Stockholm Conference*, addressed environmental protection as an action that must be taken and addressed at the global level, and that must reduce the impact of human actions on the environment. Over the years, other international conferences and treaties were held such as *The Club of Rome* and the "*Limits to Growth*" report which treated population growth as a consequence of the scarcity of natural resources and the carrying capacity of the planet, which is explained as the resources that the planet can provide in a sustainable basis. *The 1992 Rio Conference* formulated 27 basic principles on sustainable development, human dignity, the environment, and obligations to preserve environmental rights. Other actors such as non-governmental organizations (NGOs), local authorities, trade unions, businesses, and researchers participated in this conference. Through the Conference, the *United Nations Framework Convention on Climate Change* was approved, which affirms the need to reduce Greenhouse Gas Emissions (GHGs) that led to the signing of the *Kyoto Protocol* in 2005.

All these efforts served as a framework for the implementation of the Paris Agreement in 2015. The signatories to the agreement recognized the urgent need to take measures on climate change. Their long-term goal is to keep the increase in global average temperature to less than 2°C above pre-industrial levels. Furthermore, this agreement strengthens the capacity of societies to deal with the impacts of climate change and provides developing

countries with better and more sustained international support for adaptation (Paris Agreement, 2015). On the other hand, the United Nations, through the Agenda 2030 for Sustainable Development, which is composed of 17 goals, aims to integrate *economic growth* with *sustainable development*. This agenda attempts, through policies, to put an end to poverty and inequality, to take measures that improve the quality of life, the quality of work, and to create actions that protect the planet and confront climate change. To achieve adequate policy planning and management for a more environmentally friendly model, investments in new technologies, products, services, and infrastructure are required. In this view, it is important that measures be taken to invest in training and in the reskilling of the workforce. The establishment of policies and regulations is essential to support the introduction of environmental legislation and incentives that promote sustainability and encourage the development of skills for jobs (ILO, 2019).

However, many countries particularly developing countries need support to finance, identify and adopt the creation of objectives and best practices that enable and facilitate socio-economic development with long-term environmental sustainability goals. For this reason, and due to an increase in the *European Union's* (EU) relations and cooperation with *The Association of Southeast Asian Nations (ASEAN)* and the framework of the *Erasmus+* program, in the fields of education, training, and youth, the **GREENCAP** project offers support to higher education institutions in Cambodia to reform their curriculum for green growth by promoting closer relations between universities and industry. The objective of this survey is to analyze the knowledge and skills required by Cambodian Stakeholders towards a transition to a green economy. In addition to give practical insights on course curriculum and research so that universities can produce skilled manpower as per demand of the Cambodian Stakeholders.

The structure of this document will be described as follows: Initially, a section will be developed with the description of the existing literature on green skills, green jobs, and the evolution of jobs towards a *green transition*. Then, an overview of green jobs and green skills in Cambodia will be analyzed. Finally, the closing section of this document will present the

study conducted with Cambodian stakeholders using the *Q methodology*, to identify current and future needs for green skills in Cambodia towards to a green transition.

1. THE GREEN JOBS AND GREEN SKILLS

Problems such as climate change and environmental degradation greatly affect the economy, the labour market, and employment, in situations such as damage to business assets and infrastructure, occupational health and safety, and labour productivity (ILO, 2016a). In turn, one consequence of these issues is the loss of productivity in some economic sectors, which are highly dependent on a healthy and unpolluted environment, such as fisheries, tourism, and the agricultural sector, where a change in climate, causes losses in certain crops and soil fertility. Measures or actions to fight these problems open the door to a "*Green transition*". This transition can be defined as the step towards an environmentally sustainable economy and society; essentially through the improvement of natural capital, the use of renewable energy and energy efficiency, the reduction of GHGs emissions, the extraction and use of fewer non-renewable natural resources, and the treatment and reduction of waste. This approach can potentially create millions of jobs, but this transition will inevitably cause the loss or relocation of jobs in certain carbon-intensive sectors with high GHGs emissions¹. In this way, the *Green transition* is called a modern-day industrial revolution because it has changed the characteristics of certain jobs and has had implications in labour markets structures around the world (Bowen, Duffy, & Fankhauser, 2016).

These new characteristics are the product of policies that integrate sustainability, the fight against climate change, and the preservation of the environment, as fundamental elements for the green transition. In turn, this transition will not only change the characteristics of

¹ The International Labour Organization (ILO) (2018) has developed estimates of the impact of the green transition on employment by 2030: "...almost 25 million jobs will be created and nearly 7 million lost globally. Of the latter, 5 million can be reclaimed through labour reallocation – that is, 5 million workers who lose their jobs because of contraction in specific industries will be able to find jobs in the same occupation in another industry within the same country. This means that between 1 and 2 million workers are likely to be in occupations where jobs will be lost without equivalent vacancies arising in other industries and will require reskilling into other occupations...".

employment, but it will also create new markets, new activities, and transform businesses, which will require to invest in training (through the acquisition of new skills and knowledges), and in the reskilling of the workforce.

In line with this, The OECD² (2019) considers that skills and training the workforce, are vital for individuals and countries to prosper in an increasingly complex, interconnected and rapidly changing world, but the development of these new skills needs the coordination and collaboration of a wide range of stakeholders, including ministries, officials at all levels of government, students, teachers, workers, employers, trade unions, etc. This should be done with the main objective of reducing the effects on employment and achieving sustainable development. In this regard, the impact on employment is an important way for policymakers to assess the effects of environmental policies on the promotion of green growth (Bowen et al., 2018).

1.1 THE CONCEPT OF GREEN JOBS AND GREEN SKILLS

In this section of the document, we will explain the definitions of *green jobs*, *green skills*, and describe through existing literature the importance of these two concepts and the structural changes in employment in a *Green Transition*.

There is no universal definition of *green jobs* and it varies according to contexts and organizations. Therefore, The International Labour Organization (ILO) defines these jobs as: “*decent jobs that contribute to preserving or restoring the environment, be they in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency. Green jobs help to improve efficiency in the use of energy and raw materials, limit Greenhouse gas emissions, minimize waste and pollution, protect and restore ecosystems, and support adaptation to the effects of climate change*” (ILO, 2019). Also, the United Nations Environmental Program (UNEP) includes: “*Green jobs need to*

² Organisation for Economic Co-operation and Development.

be decent work³, i.e. good jobs which offer adequate wages, safe working conditions, job security, reasonable career prospects, and worker rights” (UNEP/ILO/IOE/ITUC, 2008).

In Green Business sense, it can be defined as those jobs that can produce goods or provide a service that benefits the environment, which is achieved through the use of more environmentally friendly production processes (Renner et al., 2008). On its part, the definition adopted by the European Commission, divide types of jobs into those in “*eco-industries*”⁴, in which jobs are green because the nature of the products or services are green⁵, and “*transformation industries*” in which jobs will be greener because their products and services were adapted and comply with the European Commission's environmental standards (European Commission, 2013). In this view, green jobs can be defined according to the economic activity or industry to which they belong.

The National Observatory of Jobs and Professions in the Ecological Economy in France (ONEMEV⁶), has been created to better identify and define jobs in the economy in a context of green transition. In turn, it produces methods, benchmarks, and analyses useful for the dissemination of knowledge about green economy jobs and professions. As part of the methodology used by ONEMEV, it has developed two approaches to understanding employment in the green economy: one focuses on the production of goods or services in the green economy and the jobs necessary for this production, which have an environmental purpose called *eco-activities*⁷ or contribute to improving the quality of the environment called *peripheral activities*⁸; the other focuses on the occupations performed by people called *green occupations*⁹ and *greening Occupations*¹⁰ (Onemev, 2019).

³ *Decent Work*: Opportunities for women and men to obtain decent and productive work in conditions of freedom, equity, security, and human dignity, in which women and men have access on equal terms. (ILO, 2019)

⁴ The environmental goods and services sector, sometimes called ‘eco-industries’ or ‘environmental industry’, comprises all entities in their capacity as environmental producers, i.e., undertaking the economic activities that result in products for environmental protection and resource management. (Eurostat, 2020)

⁵ Environmental goods and services are those that directly benefit the environment or conserve natural resources.

⁶ ONEMEV : L’observatoire national des emplois et métiers de l’économie verte.

⁷ *Éco-activités*: These are activities producing goods and services to protect the environment or the management of natural resources. (Onemev, 2019)

⁸ *Activités périphériques*: These are all activities producing goods and services conducive to the protection of the environment or the sustainable management of resources, without having an environmental purpose. (Onemev, 2019)

⁹ *Métier vert* : It is a position whose purpose and skills contribute to measuring, preventing, controlling and correcting negative impacts and damage to the environment (Onemev, 2019)

¹⁰ *Métier verdissant*: Jobs that make an indirect positive contribution to the environment and whose purpose is not environmental, but which integrate new skills to take environmental management into account. (Onemev, 2019)

There is currently a debate about which jobs can be qualified as green. This is because many definitions of green jobs do not include jobs that are not directly involved in improving environmental conditions but are indirectly involved. To explain this situation, for example, there is the case of a person who works in an office as a secretary for a company that produces solar panels. Her job is not categorized as a green job, but the industry in which she works is in an industry that promotes the use of renewable and more environmentally friendly energies; therefore, it is an industry categorized as green. To respond to this problem in the definition of certain green jobs, there are some methodologies for their measurement according to the proportion of direct, indirect, and induced jobs created in the economy. The methodology of the Input-Output tables allows the calculation of direct, indirect, and induced effects through the sectoral interrelationship of the branches of the economy. This methodology will be further explained in the following section.

In the transition to a green economy, and the promotion of green jobs, the economy and the labour market create skill needs, particularly in specific sectors such as the energy sector, construction sector, agriculture or in the scenario of a circular economy. In addition, one effect of the green transition on jobs is the need to re-skill or upgrade skills in existing occupations. We can refer to these skills as **Green skills**. Broadly, we can define *Green Skills* as those capabilities, knowledge, experiences, techniques that are necessary to perform the tasks for green jobs. Following this, Martinez-Fernandez et al., (2013) defines **Green Skills** as “*the skills needed by the workforce, in all sectors and at all levels, in order to help the adaptation of the products, services and processes to the changes due to climate change and to environmental requirements and regulations*”. In this context, for example, the Australian Government and state and territory governments, have determined that Australia's transition to a sustainable and low-carbon economy will require new skills, technologies, practices, and new ways of thinking, working, and doing business. Within this framework, The Council of Australian Governments (COAG) (2010) has defined green skills as: “*the technical skills, knowledge, values, and attitudes needed in the workforce to develop and support sustainable social, economic and environmental outcomes in business, industry and the community*”.



For their part, education and skills development need a new direction to create fundamental knowledge, training the workforce to manage the transition to the green economy. This issue is currently of great importance to many Higher Education Institutions and the development of new academic programs in the future. They must include reforms to education systems and address the absence of teachers and trainers for future green jobs. For this reason, modernization and upgrading of skills and knowledge production programs, both in Higher Education Institutions and in the general education system, is essential. These efforts can be carried out through the creation of policies by the ministries of education, ministries of labour, and ministries of environment and coordination among all stakeholders and/or actors in the economy. This topic will be addressed and should have a framework and a concrete plan and should be based on studies and assessments within each economy, considering the level of economic development and the state of transition to a green economy (Maclean et al., 2018).

1.2 MEASURING GREEN JOBS

Nowadays, there are several methods to calculate and estimate green jobs, at a global, regional, and sectoral level; The following is a brief description of the methods commonly used in the existing literature to measure these kinds of jobs.

1.2.1 Inventories and Surveys

The methodology of the surveys and inventories provides a way to evaluate how many green jobs exist in certain sectors of the economy. It is done through a national or regional database that provides employment statistics or through a survey in the form of a questionnaire sent to companies, government departments, or analysts. (ILO, 2013)

This methodology allows to identify the number of direct jobs per sector of the economy and favors the application of policies to stimulate these sectors. Therefore, among the limits of this methodology, it does not allow to calculate the indirect or induced jobs.

1.2.2 The industry- output approach and the process- occupational approach.

Among the most widely used methods for measuring green jobs is a method that focuses on industries that produce environmentally friendly products or services; Eurostat (2020) defines these outputs as: *“Environmental goods and services are products manufactured or services rendered for the main purpose of: preventing or minimizing pollution, degradation or natural resources depletion; repairing damage to air, water, waste, noise, biodiversity and landscapes; reducing, eliminating, treating and managing pollution, degradation and natural resource depletion; carrying out other activities such as measurement and monitoring, control, research and development, education, training, information and communication related to environmental protection or resource management”*.

In this context to measure and define jobs by this method there are two approaches: *an industry output approach and the occupational process approach* (Slaper & Krause, 2009) (ILO Regional Office for Asia and the Pacific, 2014b).

The output/industry approach which identifies establishments that produce certified green goods and services and counts the associated jobs. Then, *The process- occupational approach* uses the classification of occupation to count the number of jobs in companies with production that contributes to the greening of the economy, i.e. this approach measures the number of jobs associated with environmentally friendly production processes and practices, regardless of whether the sectors in question are considered environmentally friendly or not.

Among the limits of this methodology is the absence of information in many cases on employment associated with production or information on the number of jobs that have been involved in a product i.e., this methodology does not allow to include all indirect jobs or jobs induced in the production process.

1.2.3 The Input-Output Method and Social Accounting Matrices (SAM)¹¹ to estimate the employment effects in a green economy.

¹¹ The Social Accounting Matrix (SAM) is a matrix representation of the national accounts and is a tool that allows the analysis of the flows of all economic transactions that take place in an economy, since it presents the incorporation of value-added and allows the description of the interrelations of income and transfer flows between the internal and external sectors of the economy.

The input-output method is an economic and statistical analysis tool that uses data on the interdependence of industries in an economy, showing how the outputs of one industry are the inputs of another, with an interrelationship between both industries. These data are known as input-output tables. Similarly, this table allows to quantify the amount of additional product needed from each sector in response to a unit increase in final demand.

The use of this method makes it possible to estimate the effects on employment resulting from an increase in the final demand for the product or service in each industry. In other words, this method makes it possible to calculate the number of jobs created by the direct production of the branches of activity of the economy, as well as those created by the interrelations or interdependence between these branches as a result of a demand stimulus. We can define the above as the *multiplier effect* of demand stimulation. In conclusion and in a general way, *the multiplier effects* that can be measured with this method are the direct, indirect, and induced effects. These three effects are defined by (Jarvis, Varma, & Ram (2011) as:

- *Direct effect: defined as an increase in demand for the goods produced by any sector leading to an increase in the output of goods from that sector.*
- *Indirect effect: as producers increase their outputs in any sector, their suppliers will also see an increase in demand for their goods, and so on. The shock of the increase in final demand for that good then ripples through the supply chain.*
- *Induced effect: as a result of these supply chain effects, the level of income in the economy will increase, and a portion of this income will be spent on other goods and services, leading to further increases in demand. This is termed an induced income effect.*

(ILO, 2013) explains these employment effects as follows: *“Investment in sustainable sectors will result in an expansion of production and the generation of a number of direct jobs. Expanded production invariably leads to a higher demand for inputs, resulting in an increase in indirect jobs in supplier industries. The increased consumer spending of those in these newly created direct and indirect jobs will also create a number of induced jobs”*. In this sense it is important in the creation and evaluation of policies to consider the indirect and induced jobs and the effects that these policies have on these sectors. For example, in the application of a policy that promotes the use of renewable energies, the employees of this sector are

considered as direct jobs, but it is important to take into account the indirect jobs, as it is the case of the informatics or logistics jobs that will participate indirectly in this sector.

The use of this method provides a good overview of the economy and supports the creation of future policies towards a green transition and the selection of the sector or industry to be stimulated according to the number of jobs generated, but this type of measure does not allow a prospective management of the skills related to the green transition.

A clear example of the use of this methodology is the one used in France by the tool "*TETE*"¹². The "*TETE*" tool is a tool based on the use of Input-Output tables, which allows quantitative estimates of the impact on direct and indirect employment at the territorial level, by the ecological transition policies for each year until 2050. In addition, this tool allows for the evaluation of jobs created and destroyed both directly in the renewable energy sectors. One of the limitations of this tool is that it does not cover the agricultural and industrial sectors, which does not allow for the development of prospects for these sectors. Moreover, this tool does not calculate the jobs induced by a multiplier effect on the rest of the economy. Finally, this tool does not allow prospective management of jobs and skills related to the green transition.

1.3 THE EMPLOYMENT EFFECTS OF GREENING THE ECONOMY AND THE SKILLS NEEDED FOR GREEN JOBS.

The transition to a *green economy* causes changes in production systems, and these changes require advances in new technologies and production processes, which have certain implications for employment since some jobs will be created in some sectors and destroyed or displaced in others. During the transition, the structure of employment will suffer changes in terms of quantity, given the creation and loss of jobs, and in terms of quality given the changes in skills and job quality. In other words, one effect of the green transition on jobs is

¹² TETE : *Transition Ecologique- Territoires -Emplois*. (Green Transition- Territories- Jobs)

the need to re-skill or upgrade skills in existing occupations. Additionally, new, and emerging green jobs tend to require higher skill levels.

According to Cedefop (2012) these changes are reflected in three types of effects on employment and the training system. Initially, structural changes lead to an increase in demand for some jobs and a decrease in demand for others. On the other hand, in many existing occupations and sectors, jobs will evolve to be more environmentally friendly, so it will be necessary to adjust the current training and qualification frameworks. Finally, new economic activities may create the need for new jobs, new skill profiles and new training and qualification frameworks.

The ILO (2012), predicts that 72 million full-time jobs will be lost by 2030 due to a rise in global temperature, which will lead to a reduction in working hours, particularly in sectors such as agriculture. Moreover, the ILO (2018) has estimated that more than 24 million new jobs could be created in 2030 and it has identified the economic sectors and scenarios in which the labour market will be subject to major changes. To describe these changes, the ILO has considered different scenarios in which employment levels and environmental impacts are estimated for the year 2030. All the scenarios draw on projections of GDP growth made by the *International Monetary Fund (IMF)* and the *International Energy Agency (IEA)* and population growth projections by the United Nations. This section will briefly describe this structural change and its effects on employment in the economic sectors and scenarios with the major changes, such as the *energy sector*, the *agriculture sector*, and the *Circular Economy*.

1.3.1 ENERGY SECTOR

The energy sector is of vital importance when it comes to efficient green transition since, together with transport, electricity and heat production represent approximately 50% of global GHGs emissions. Among the keys to achieving this transition figure the substitution of fossil energies by energies from renewable sources, for example, solar or wind energy. In order to achieve the proposed objective of limiting global warming to 2°C compared to the pre-industrial era, this study assumes that by 2030, in terms of electricity, there will be a 59% increase in electricity generated by solar panels, compared to the data for 2012. In addition to this, there will be a 50% decrease in fossil fuels.

Energy also influences sectors such as transport and construction. In transport, harmful gas emissions are mainly avoided by electric batteries, especially when these come from renewable sources. In this same scenario, 14% of new car sales by 2025 will be electric vehicles. In construction, a drop in energy demand for buildings is also predicted in this scenario, due to the search for resource efficiency and in the quest to improve existing buildings.

As a result, in this scenario, the International Labour Organization (2018) concluded that if actions towards a transition continue, around 18 million jobs will be needed in the energy sector by 2030. Manufacturing and construction are expected to create 4 million and 9 million jobs, respectively. For two sectors combined, for example, 2 million jobs are expected to be created in the manufacture of electrical machinery needed to produce electric vehicles and electricity generation from renewable energy.

In the case of the Americas, the Asia-Pacific region, and Europe, it was concluded that 3, 14 and 2 million jobs will be created, respectively. While for the countries of the Middle East and Africa the panorama is not encouraging since if they continue without changing their policies for the year 2030, there will be a loss of 300,000 and 350,000 jobs, respectively.

1.3.2 AGRICULTURE SECTOR

Agriculture remains a dominant sector in terms of employment and production in many developing countries. It is also one of the activities most vulnerable to climate change. According to FAO (Food and Agriculture Organization of the United Nations, 2011) data, agriculture represents important challenges in terms of soil degradation, land degradation, desertification, and freshwater shortage. Due to the above, it has become one of the main sectors in GHGs emissions. Also, this study found that more than one billion people worldwide are employed in the agricultural sector, a large percentage of them on small and family farms. Another study carried out by the ILO (2016b) found that most workers who can be classified as poor are employed in agriculture. For example, in developed and emerging economies, 70%

of workers in this sector are migrants from poorer countries. (Bureau of Labor Statistics, United States Department of Labor, 2017).

There is, on one side, *Conservation Agriculture (CA)* is defined by the FAO as a system of cultivation that can prevent the loss of arable land and at the same time regenerate degraded land. Conservation agriculture promotes the maintenance of permanent soil cover, minimum tillage, and diversification of plant species. This type of agriculture is practiced on more than 125 million hectares around the world and it is practiced on 70% of the arable land in Argentina, Brazil, Paraguay, and Uruguay. On the other side, *Organic Agriculture(OA)* is defined as a production system that tries to make maximum use of farm resources, emphasizing soil fertility and biological activity while minimizing the use of non-renewable resources and not using synthetic fertilizers and pesticides to protect the environment and human health.

Within the scenarios taken for this study, there is firstly a shift towards conservation agriculture in developing countries and secondly a shift towards organic agriculture in developed countries. By 2030, under these scenarios, the ILO expects sustainable agricultural production to grow by 30%. Under these scenarios, they found that there would be a decline in employment globally, less so in Europe. This means that around 120 million fewer jobs will be needed compared to a scenario where no change is made. These losses will be focused on Africa, with about 20 million fewer jobs, and on Asia and the Pacific, with a loss of about 100 million jobs.

1.3.3 CIRCULAR ECONOMY

Finally, in this study, after having analyzed the future changes in energy and agriculture, the ILO analyzes the changes that can be seen in a scenario where the circular economy is primordial. The circular economy is mainly based on the reuse, repair, and recycling of the different raw materials to avoid their extraction. In this scenario, they propose to encourage companies to produce goods that will have long useful lives and that can be

reused as inputs in other industries at the end of their life cycle. The circular economy keeps products, components, and materials at a high level of utility and value. (Ellen MacArthur Foundation , 2013)

Other hypotheses taken by the ILO include an 5% annual increase in recycling rates for plastics, glass, wood pulp, metals, and minerals until 2030, replacing the direct extraction of primary resources for these products. Finally, the ILO concluded during the study that 6 million jobs may be created by 2030 in economies that are ready to adopt the principles of the circular economy, including recycling and the service economy. In turn, the growth of services will generate 50 million new jobs and waste management 45 million. Regionally, this relocation of jobs will positively affect America and Europe with the creation of 10 million and 0.5 million jobs, respectively. In contrast, if no change is made to promote economic diversification in the Asia-Pacific and Africa regions, by 2030 an estimated 5 million and 1 million jobs will be lost, respectively.

1.4 THE SKILLS NEEDED FOR GREEN JOBS: THE CHALLENGE FOR A GREEN TRANSITION

The transition to a green and low-carbon economy will create new jobs, generate some job losses, and change the composition of skills in other jobs. Given this context, the public and private sectors will require workers to train and acquire new skills to respond to new labor market needs. In a green transition, jobs require both *technical skills* (specific to each occupation and economic sector) and *core(soft) skills*. Among the main core skills required for green jobs, by the skill level of occupation, ILO (2019) defines skills in two ways: *The skills required across the labour force* and *The Skills required in medium to high-skilled occupations*. A description of these skills found by ILO is given below:

- *Required across the labour force: Environmental awareness and protection; Adaptability and transferability skills; Teamwork skills; Resilience to see through the changes required; Communication and negotiation skills; Entrepreneurial skills; and Occupational safety and health (OSH).*



- *The Skills required in medium to high-skilled occupations: Analytical thinking (including risk and systems analysis); Coordination, management, and business skills; Innovation skills; Marketing skills; Consulting skills; Networking, IT and language skills; Strategic and leadership skills.*

According to the ILO (2019), gaps, and shortages of both types of skills are likely to be widespread, especially in low-income countries, which may create limitations in the transition to a green economy. In this sense, *The OECD National Skills Strategy Project* (2019) has helped some countries to develop national strategies for the development of policies that support the *developing of relevant competencies, using skills efficiently and effectively, and strengthening the governance of skills systems*. To this extent, the involvement of a wide range of ministries is important for the OECD to better understand the country's objectives for the future and to engage all stakeholders to improve understanding of the current skills challenges and opportunities, and especially to analyze their perspectives on the policy responses needed for the development of these skills and knowledge.

Within this framework, it is necessary for the development of this survey to carry out a description of the main challenges of green skills in the transition to a green economy. To fulfill this objective, The table 1 will be used, based on information from the document prepared by International Labour Office (ILO) (2011).

Table 1 The Main Skills Challenges Towards A Green Transition

| THE KEY SKILLS CHALLENGES | DESCRIPTION |
|--|--|
| Challenge 1: Skill shortages are already hampering the transition to greener economies. | A lack of the skills needed to meet the requirements of changing and newly emerging occupations impedes green investment and hinders green economic development. This equally applies to skills of established occupations for which demand is growing. Shortages generally reflect underestimates of growth and labour demand, particularly in technology driven green sectors. Many countries lack sufficient teachers and trainers in environmental awareness and specialist areas such as renewable energy. |
| Challenge 2: Skills and environmental policies need to come together. | While most countries have drawn up some environmental policies, few have put in place the skills development strategies needed to implement them. Without coherence between skills and environmental policies, skills bottlenecks may well impede the successful transition to greener production and consumption. |
| Challenge 3: Green structural change will be profound in certain sectors | High carbon emitting sectors are most likely to be negatively affected by green structural change. These include mining, fossil fuel-based energy generation, manufacturing, forestry, and agriculture. Workers moving out of declining sectors into growing ones will require retraining. The role of employment services in matching skills and jobs and in retraining workers and jobseekers is thus crucial. |
| Challenge 4: Occupations will change at different rates and in different ways as economies go greener | Not all greening will involve fundamental change in occupations. Some occupations will not change at all. There will be far more established occupations requiring skill upgrades than brand new occupations. Where new occupations are created, they often call for higher-level qualifications, either because of their dependence on new technologies or because they require sophisticated skills in. The core skills identified as necessary for the new green worker include environmental awareness and willingness to learn about sustainable development as well as general learning and decision-making ability. |

| | |
|--|--|
| Challenge 5: Skills required in a greener economy need to be identified | Ways of classifying and measuring green jobs are only now being refined. In their absence, most countries have relied on qualitative data gathered through enterprise surveys, occupational research, or consultation with experts. There is thus a need to develop complementary quantitative methods to identify the specific occupational needs of a greening economy. |
| Challenge 6: Appropriate training needs to be put in place promptly | Training systems need to respond quickly, as demand changes fast. This is a particularly challenging requirement, given that the updating of courses usually takes a couple of years. Government-sponsored training programs have proved valuable, notably where they take advantage of formal education and training systems with well-established flows of information between industries and training institutions. |

Source: Own elaboration based on the document "Greening the Global Economy the Skills Challenge" (ILO, 2011)

These challenges must be followed according to the needs that each country has on the road to a green transition. From this point of view, policymakers must identify the employment and skill needs that the green transition demands. Also, they must involve all stakeholders in improving their understanding of the current challenges and in analyzing their perspectives on the policy responses needed for the development of those skills and knowledge.

1.5 GENERAL OVERVIEW OF GREEN JOBS AND GREEN SKILLS IN CAMBODIA

In this section of the survey, an initial overview of the economy and employment structure in Cambodia will be made. Secondly, a description of the state of the environment and natural resources in this country and the impacts on the pollution of these resources. This will be followed by an analysis and description of the Cambodian government's policies in response to the threats of climate change and towards a Cambodian green transition through the *National Environment Strategy and Action Plan 2016-2023*. Finally, a description and analysis

of the scenarios for green transition in Cambodia, and an analysis of the creation of green jobs and the skills needed in the face of these scenarios will be carried out.

Before analyzing Cambodia's transition to a green economy, and its situation in terms of green skills and jobs, it is important to make an overview of the country, the economy in general and the structure of employment. This analysis will be done through data provided by the World Bank, the International Labour Organization, the Asian Development Bank, among others.

1.5.1 CAMBODIA- General Country Context

Cambodia, officially the *Kingdom of Cambodia* is a country located in Southeast Asia and therefore belongs to the Association of Southeast Asian Nations (ASEAN). Cambodia has an area of 181,035 square kilometers and a population of about 16.48 million in 2019. (World Bank data). Its population is mostly rural and has a fertility rate of 2.5 children and a life expectancy of 69.7 years. About 64 per cent of the population is of legal working age (15-64 years). In 2018, the labour force participation rate was 84.9 per cent and the total unemployment rate in 2018 was 0.18 per cent, with a youth unemployment rate of 0.42 per cent. In terms of employment by sector, the agricultural sector has 42% of employment, the service sector 20% and the industrial sector 38%. (International Labour Organization, ILOSTAT database).

In the economic context, Cambodia continues to show signs of strong growth and Cambodia is likely to remain the fastest growing economy in the East Asia and Pacific region. This economic growth is supported by good export performance and strong domestic demand. However, key macroeconomic data for the first six months in 2019, indicate a slight slowdown in economic activity, represented by a 7% economic growth, compared to strong growth of 7.5 per cent in 2018. Garment and footwear exports, which account for about 70 percent of total merchandise exports, grew by 17.7 percent in 2018, but declined slightly to 15.3 percent in June 2019. (World Bank Group, 2019)

On the other hand, labour income growth was the main driver of poverty reduction in Cambodia. A decomposition of income shows that waged and unwaged agricultural incomes

were the main drivers of poverty reduction in Cambodia during the period 2009-2017. Among the projections made by the World Bank Group (2019), it is expected that poverty reduction will continue in Cambodia, where labour income has now become the main driver of poverty reduction, and that economic growth, particularly the growth of labour income in the form of higher wage income, will continue. However, most poor people have wage incomes and low-paying jobs, indicating that low skills and productivity remain a challenge for policymakers.

1.5.2 The Environment and Natural Capital Management in Cambodia.

According to the *Global Green Growth Institute* (GGGI) (2018), Cambodia has different types of natural resources including large water resources with the Mekong River and the Cardamom Mountains which allow for high-quality fishing and high productivity; as well as natural resources that encourage tourism such as mangroves and coral reefs. Although these natural resources are currently at high risk, this is due to the overexploitation of forests and lands, as well as excessive fishing in some areas of the country. On top of that, global climate change also affects the availability of freshwater and the decrease of arable land for agriculture.

The data published by the World Bank (2017), half of Cambodia's surface is covered by forests, from which the economy extracts wood and firewood. These forests generate different advantages for the territory, among them, the protection of the hydrographic basins, the reduction of soil erosion, and help to avoid the floods. Of the forests mentioned above, it is known that they cover about 8 to 10 million hectares of the territory. Among these forests, bamboo plantations represent a large percentage. Based on FAO estimates for 2016, only 12,746 hectares of Cambodia's nearly 10 million hectares of forest are certified by the Forest Stewardship Council.¹³

Cambodia has been ranked as one of the most diverse countries in Southeast Asia. In terms of birds, it has more than 601 species and is home to 162 species of mammals. Among the protected areas for the conservation of bird species, Cambodia has Boeung Tonle Sap and its flood zone and its inundation zone and the northern deciduous dipterocarp forest plains.

¹³ It is “a process through which transnational networks of diverse actors set and enforce standards for the management of forests around the world” (Meidinger, 2003)



According to 2018 data, 1357 species of fish were recorded in the freshwater and saltwater systems together: 173 species of reptiles, 72 species of amphibians, 671 invertebrates, and 3113 species of plants. Cambodia has 7 national parks, 10 wildlife sanctuaries, 3 protected landscapes, 3 multiple-use areas, 6 protection forests, and 8 fish sanctuaries. (KEI, 2018)

1.5.3 The Environmental Issues and Climate Change

Cambodia, today presents a rapid economic growth, cataloging as one of the countries with greater growth in the region of Southeast Asia. Nevertheless, this high rate of economic growth has brought with it a number of environmental problems such as the degradation of natural resources, increased water and air pollution, and increasing amounts of solid waste in urban areas; these environmental problems degrade the environment and harm human health.

Among the environmental problems in Cambodia, the forest area decreased between 1990 and 2016 to about 52.9 percent of the total area (ILO Regional Office for Asia and the Pacific, 2019b); this is largely due to the indiscriminate felling of trees for logging, the transformation of the forest into land for cultivation and the implementation of activities such as agriculture among other factors. On the other hand, due to climate change and the increase in global temperature that to a large extent causes associated disturbances such as floods, droughts, forest fires, acidification of the oceans, and loss of some crops. In this situation, Cambodia is in a high-risk area for flooding due to the increase of the ocean level and rainfall and monsoons; *“According to the World Risk Report,⁹ Cambodia has a medium World Risk Index score. It ranks number 8 of 171 countries because of its medium exposure to natural hazards and limited institutional capacity to cope and adapt. Part of the country’s vulnerability relates to the 7.2 per cent of the total population who, in 2010, lived in the 2.7 per cent of the total land area that is less than 5 meters above sea level”* (ILO Regional Office for Asia and the Pacific, 2019b).

According to the ILO (2019b) and the World Bank database, CO₂ emissions have increased by 7% between 1990 and 2014. With a value of 1261.4kt (kilotonnes) in 1990 and 6684.9kt in

2014. The causes of this increase in CO₂ emission levels are due to land use change and forestry; followed by the combustion of carbon-based fuels in the transport sector.

1.5.4 Green transition in Cambodia: National Environment Strategy and Action Plan: 2016-2023.

As it has been analyzed in the course of this document, Cambodia is a country that has a great number of natural resources, and at present, it is one of the countries with greater growth in the region of the countries of Southeast Asia. This economic growth has caused serious problems such as environmental degradation. To reduce these issues, it is essential for all actors, such as the government, to create policies and plans to protect the environment and guarantee sustainable and green growth.

In this regard, in 2015, the Government of Cambodia through the Ministry of Environment has presented the "*National Environment Strategy and Action Plan (NESAP) 2016-2023*". Through this program, the government aims to encourage ministries and public institutions, the private sector, educational institutions, non-governmental organizations, and stakeholders to integrate environmental issues into policies, strategies, action plans, and investment plans at the national and sub-national levels. The formulation and implementation of the NESAP Plan is essential for Cambodia to achieve the objectives in terms of development, protection, and conservation of the environment. To successfully carry out these efforts, this plan focuses on three general reasons that need to be addressed: *Environmental sustainability is the main source of growth and development; Environmental deterioration is prevalent; Meeting future growth needs a sustainable supply of environment and natural resource goods, services, and functions.*

According to this mission, it is fundamental for the Cambodian government to include all actors, stakeholders and economic sectors in the policymaking plans that favor development, environmental sustainability, and a path towards a green economy with social equity. To achieve the mission of the National Environment Action Plan for 2016-2023, four main strategic objectives have been identified:

- *Strategic Objective 1:* Strengthen cross-sector collaboration and relevant legal instruments and guidelines to improve coordination, regulation, and delivery functions for sustainable development outcomes.
- *Strategic Objective 2:* Improve resource use efficiency for a healthy environment and social well-being, while increasing business competitiveness and incentivizing technological innovation.
- *Strategic Objective 3:* To develop and implement financing mechanisms, benefit sharing schemes and fund mobilization plans for investing in the modernization of the management and conservation of environment and natural resources.
- *Strategic Objective 4:* To raise public awareness, build individual and institutional capacities, promote technology transfer, and strengthen the application of monitoring and science and technology to improve the management and conservation of environment and natural resources.

In conclusion, employing this policy and through its objectives, the Cambodian government aims to create the institutional and human capacity to apply the instruments and tools of environmental policy; also to create and execute development programs for the conservation of the environment, the management of natural resources and to strengthen public and private sector awareness towards the application of environmental decision making. On the other hand, an analysis of the objectives of the "National Environment Strategy and Action Plan: 2016-2023" shows that Cambodia is very interested in a green transition. In comparison with global policies, the challenges proposed in Table 1 of this document, for example, which identifies the main challenges in terms of green transition skills, are strongly related to the objectives proposed in this Cambodian strategy. This relationship shows, for example, that this country is following a good path towards green transition, which favors the identification and inclusion of the skills that will be needed in the new labor market, as indicated for example in objective 2 of this strategy.

1.5.5 Scenarios for Green Transition in Cambodia: Description of Agricultural and Renewable Energy sector.

1.5.5.1 Agricultural Sector



The agriculture sector plays a key role in contributing to economic growth and development and poverty reduction in Cambodia. According to the World Bank (2015), the number of people living in poverty in Cambodia decreased from 53% in 2004 to 18 % in 2012, and more than 60% of poverty reduction was a result of positive developments in this sector. According to the Ministry of Economy and Finance, the agricultural sector contributed about 20% of the GDP in 2017. The ILO Regional Office for Asia and the Pacific (2019b) estimates that employment in Cambodia depends largely on the agricultural sector with an employment rate of 42 per cent in 2018.

However, due to the consequences of climate change and a rise in global temperature, the agricultural sector presents great challenges in terms of soil degradation, land degradation, desertification, and freshwater scarcity. Under a scenario of climate change, and an increase in global temperature, Cambodia will present great social, environmental, and ecological difficulties in this sector. For example, this increase in global temperature will threaten Cambodia's food security, with predictions of a 10-25% reduction in fish production and a 20-25% reduction in rice production (GGGI, 2018). In response to these challenges, this sector must implement measures to reduce the impact on climate change and environmental degradation. The Asian Development Bank (2018) promotes to reduce these impacts Cambodia should focus on rehabilitation of irrigation, improvement of flood control infrastructure, support to small farmers, and building resilience to climate change.

The Royal Government of Cambodia , (2017) through the *National Environment Strategy and Action Plan* (NESAP) has identified several limiting factors in the agricultural sector, which it is essential to urgently address. Among these constraints are: *i) predominance of rain-fed agriculture which is highly vulnerable to climate change; ii) underdevelopment of irrigation and drainage; iii) lack of detailed soil classification and land use spatial planning, and lack of clear procedures for forest and land use; iv) limited access to extension services and agricultural skills including soil management, selection of seed varieties, fertilizer and other technologies; v) limited access to rural credit; and vi) inadequate post-harvest process management and market.*

As a result of the creation of these policies and the search for a sustainable agricultural sector, which reduces its impact on climate change and environmental degradation, there are opportunities to create green jobs through sustainable production and the implementation of organic agriculture. According to ILO Regional Office for Asia and the Pacific (2019b), the agricultural sector had a strong potential for green job creation in 2012 with a rate of 33.3%.

1.5.5.2 Renewable Energy Sector

According to the report developed by *the Global Green Growth Institute (GGGI, 2018)*, different public agencies are responsible for managing the electricity sector in Cambodia, including *the Ministry of Mines and Energy, the Electricity Authority of Cambodia, Électricité du Cambodge, The Ministry of Environment, The Ministry of Water Resources and Meteorology, and the Ministry of Agriculture, Forestry and Fisheries*. Based on the analysis of data in this report, the electricity demand has seen a steady increase since 2010 in Cambodia. The Economic Research Institute for ASEAN and East Asia (ERIA) 2016, estimates growth of about 20% in electricity consumption, from 2,254GWh in 2010 to 5,201GWh in 2015. The electricity used in Cambodia is not only being offered internally but also through imports from neighboring countries.

The Cambodian government seeks to meet the goal set by the Association of Southeast Asian Nations (ASEAN) of achieving 23% renewable energy use by 2025. In addition to this, they seek to achieve total electrification of villages by 2020 and 70% electrification of homes by 2030 (some 14,000 villages and almost 2.5 million homes). Under this premise, renewable energies have been identified as solutions to reduce the use of and dependence on diesel energy. In the medium and long term, a small-scale hybrid system is being sought. In this context, the creation of new jobs for installing and maintaining the equipment will be required, which will promote the creation of green jobs in this sector.

According to the ILO Regional Office for Asia and the Pacific (2019b), in 2018 around 5,500 people were employed in the renewable energy sector, the vast majority of them in hydroelectric power. This was a major shift in employment in Cambodia, as, by 2018, only 0.3% of the population was employed in the electricity, gas, and steam sectors. According to

the ILO, thanks to the momentum of growing dependence on renewable energy, there is the potential to create green jobs opportunities in the future.

To conclude this chapter, it is important to note that the construction of scenarios for a green transition encountered difficulties in terms of the quantity and reliability of data on the green economy, green sectors, green and decent jobs, to assess the impact of climate change and climate-related policies on social inclusion in Cambodia and some Asia-Pacific countries. For future research and internships, better data on green and decent jobs are needed to assess the impact of climate change and climate-related policies on social inclusion. Without better data, it will be difficult to determine what policy changes are needed to ensure a just transition to environmental sustainability and to analyse progress.

2. Q METHODOLOGY: STAKEHOLDER ANALYSIS TO DEFINE EXISTING AND FUTURE GREEN SKILLS REQUIREMENT TOWARDS A GREEN TRANSITION IN CAMBODIA.

University curricula need to be frequently updated in line with changing market demands, and a strong synergy between the university and stakeholders can ensure the quality of education to produce a skilled and adaptable workforce for sustainable development and green transition. One of the objectives of the GREENCAP project is to improve the labor market matching process in the field of green business and green growth through close cooperation between higher education institutions and stakeholders in Cambodia. For this reason and using the Q Methodology, this study aims to identify the knowledge and skills required by stakeholders, in the process of transition to a green economy and green business in Cambodia.

This section is structured as follows: Initially, an analysis of the theoretical framework of the Q Methodology will be conducted, including an overview of the Q Methodology applied to the

stakeholder analysis. Secondly, a description of the elements of the Q Methodology and the design of the study will be presented. Finally, a presentation and analysis of the results obtained will be provided.

2.1 THEORETICAL FRAMEWORK OF THE Q METHODOLOGY

The Q methodology was developed by William Stephenson (1953), who was interested in the structure of individual subjectivities. This methodology is often used to study or identify the opinions or perceptions of individuals concerning a phenomenon, problem, issue, or topic (Brown S. , A Primer on Q Methodology, 1993). The objective of this method is to measure the subjectivity of individuals through different statements or declarations that individuals classified according to their point of view (Brown S. , 1986). The motivation for developing this methodology was based on the fact that existing quantitative methods in the social sciences did not take into account the point of view of individuals (Brown S. , 1996).

Today this methodology is commonly used in a wide range of fields of knowledge, such as political science, health science, psychology, among others¹⁴. For the interest of this study, a review of certain existing literature focusing on environment and policymaking, sustainable development, natural resources management, and analysis of the stakeholder perspective on these issues will be considered.

Within this field, Barry & Proops (1999) identified the application and benefit of the Q methodology for the study of environmental issues within the green economy, and the development of environmental policies in the UK. They found that this method could serve as a mechanism for policymakers to select and implement environmental policies, by identifying how individuals perceive environmental issues. This assumption will serve to identify which policies are likely to receive the most support and from whom, i.e. to achieve the objective of formulating policies with the widest possible acceptance.

¹⁴The website <https://qmethod.org/category/resources/publication/> includes several publications on various topics through the Q-methodology.



2.2 Q METHODOLOGY ELEMENTS AND SURVEY DESIGN

2.2.1 The Q methodology elements

There are different technical terms related to the Q methodology that are fundamental to the development of this methodology, and that will be explained below.

The **Q-set** is more generally defined as the set of statements, images, or sounds, which are selected as samples to be used during the study, or more generally, as the set of statements presented for classification (Gauzente, 2005). In this survey, the Q-set are the statements that represent the knowledge and skills that employees should have, in the process of transition to a green economy and green business in Cambodia. According to Brown (1993), the purpose of the Q-set is to provide an overview of the entire process modeled.

Following this, the participant of the survey, (**The P-set**) are asked to classify the statements presented in a pyramid grid, with some items placed at the extremities and others in the middle. For example, where the extreme left and right columns refer to “Strongly Disagree” and “*Strongly Agree*”. It is this distribution that makes subjectivity the central dynamic of the Q Method and allows for the comparison of the Q classification between individuals (Brown S. , 1986). This set of ranked statements constitutes **the Q- sort**. The complete Q-sort of each participant correlates to the Q-sorts of the other participants. Then, the **factors** are created and analyzed. The **factor analysis** will show similarities between participants’ sorting of the statements. *Factorial analysis aims to explain observed relations among numerous variables in terms of simple relation* (Cattell, 1965).

2.2.2 The design and application of the survey

The design and application of this survey are based on the traditional procedure of applying the Q methodology, proposed by (Stephenson, 1953), (Brown S. , 1980), (Brown S. , 1986), and based on (Barry & Proops, 1999) and the paper by (Webler, Danielson, & Tuler, 2009), to reveal social perspectives in environmental research.

Before starting the application of the Q-methodology, some steps are taken to find the relevant results of this research. Initially, an analysis of the study's objectives was carried out and the research topic was established, which allowed us to determine the population to be surveyed whose perspectives we are interested in learning about. In the case of this study, the objective is to determine the knowledge and skills needed by the stakeholders in the process of transition to a green economy and green business in Cambodia.

Once the objectives and the population to be surveyed are clear, we proceed to elaborate on the statements that will make up the Q-set. For the preparation of the statements, a literature analysis was carried out through publications of different international organizations, such as the International Labour Organization, the United Nations, the OECD, among others, to determine the trend of ecological knowledge required in an green transition. Based on this search, the first result was presented with a list of statements, including highly technical and sectoral green skills, which were difficult for participants to understand. Finally, in a virtual meeting with the project coordinators, a final list of 15 statements was adopted, which are easier to understand and more applicable to different sectors. This list of statements can be found in *Appendix 1*.

Once the list of Statements is ready, we proceed to design the distribution grid. For this study, the distribution ranged from "-2" to "+2", where -2 is ***The Strongly not necessary Skills***, -1 is ***the Not necessary Skills***, 0 is ***you're not sure or you do not have an opinion*** (Neutral), +1 is ***Necessary Skills*** and +2 ***Strongly Necessary Skills***. The design of the distribution grid can be found in *Appendix 2*.

After having defined the statements and the classification grid, we proceeded to the analysis of how the survey should be administered. Due to the global crisis of the COVID-19 pandemic, the application of the survey had to be done via email and using "Q-Software"¹⁵ software. The use of this software allowed the stakeholders to complete the survey remotely. Cambodian

¹⁵ This software was developed by Alessio Pruneddu in 2010. This software is free to access and allows to complete any Q-sort due to a very easy using design.

stakeholders were invited to participate in this survey via email. In this email, a link was attached for the development of this survey, which is as follows:

<https://application.qsoftware.net/user/camilogonzalezberbeo/>

In this software we tried to make the survey as easy as possible to develop and understand, explaining each step-in detail. To implement the survey, respondents were initially asked to classify the 15 statements into 3 categories (*Not Necessary Skills, I do not have an opinion (Neutral), and Necessary Skills*) by answering the following question: ***What kind of skills do you consider important for the development of green businesses in the future?***

Each statement is shown on the screen and the respondent should drag the statement into one of the 3 boxes according to his/her opinion. When this step is completed, the respondent sees three pre-filled columns at the top of the screen that reflect the answers given in the previous step. Below these columns is the classification grid described above, through which the respondent must classify each statement by prioritizing it according to a relative level of ***The Strongly not necessary Skills, the Not necessary Skills, you're not sure or you do not have an opinion, Necessary Skills and Strongly Necessary Skills***. There were an equal number of statements as of boxes, and that forced the respondent to choose precisely where he/she would place each statement.

Once this survey was carried out, 8 responses¹⁶ were obtained from stakeholders, which is why they are considered relevant according to the number of statements expected. This is based on the study conducted by Webler, Danielson, & Tuler, (2009) which explains: *“The ideal number of Q participants is a tradeoff between two rules of thumb. The upper end is determined by the rule that it is wise to have more observations than variables in a study where statistics will be used to analyze the results. In a Q study, the “observations” are the Q statements and the “variables” are the Q sorts (which is inverted from normal survey research).*

¹⁶ With the commitment to keep the survey anonymous, the names of the participants will not be presented. In this case each participant will be named as a Stakeholder "#".

Q researchers often aim for a 1:3 ratio". When these results have been obtained, the treatment and analysis is carried out. For this process we used the free access software Ken-Q Data. The analysis of the data will be carried out in the following section.

2.3 FACTOR CONSTRUCTION

2.3.1 Choice of factors

Table 2 Unrotated factor matrix

| Respondent | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 | Factor 6 | Factor 7 | Factor 8 |
|--|---------------|---------------|---------------|----------|----------|----------|----------|----------|
| Stakeholder 1-NGO1 | 0,5179 | -0,704 | 0,0201 | 0,012 | 0,4123 | 0,1673 | -0,0502 | 0,1873 |
| Stakeholder 2-Private Sector1 | 0,0641 | 0,8066 | 0,0938 | 0,2884 | 0,4251 | -0,1068 | -0,2464 | -0,0216 |
| Stakeholder 3- NGO2 | 0,6771 | 0,2202 | -0,5521 | 0,2161 | 0,2127 | -0,1481 | 0,2681 | -0,05 |
| Stakeholder 4- Private Sector2 | 0,5076 | 0,4794 | -0,411 | -0,4792 | -0,2454 | -0,1396 | -0,1284 | 0,1333 |
| Stakeholder 5- Private Sector3 | -0,3077 | 0,8161 | 0,3 | -0,0944 | 0,085 | 0,2537 | 0,2216 | 0,1402 |
| Stakeholder 6-NGO3 | 0,616 | 0,1357 | 0,1395 | 0,593 | -0,4451 | 0,1648 | -0,0464 | 0,0594 |
| Stakeholder 7- NGO4 | 0,8011 | 0,1453 | 0,2633 | -0,3491 | 0,0583 | 0,3368 | -0,0239 | -0,1688 |
| Stakeholder 8- Private Sector4 | 0,4774 | -0,0594 | 0,7572 | -0,0891 | -0,0137 | -0,423 | 0,0867 | 0,0258 |
| Eigenvalues | 2,3323 | 2,1337 | 1,2351 | 0,8499 | 0,6651 | 0,4647 | 0,2109 | 0,1082 |
| | 29 | 27 | 15 | 11 | 8 | 6 | 3 | 1 |
| Cumulative % explained variance | 29 | 56 | 71 | 82 | 90 | 96 | 99 | 100 |

Source: Own elaboration

The *unrotated factor matrix*, which consists of 8 factors, enabled it to know the number of factors to be kept. Firstly, it shows that the answers are very scattered. It allows seeing if each participant gave much or little information for each factor and if this information is positive or negative. For example, "Stakeholder 5- Private Sector3" gave a lot of information in the negative (-0.3), while "Stakeholder 2-Private Sector1" did not give a lot of information in the positive (0.06) for factor 1.

There are two methods for choosing the number of factors to keep. Firstly, according to the *cumulative explanatory percentage*, it can be noted that with 3 factors the percentage is 71%.

It is, therefore, close to 60 – 70 % and allows it to give a correct summary of the information. Secondly, according to the *criterion of eigenvalue*, it should be retained exclusively the factors so the value is higher than 1, so it should be also 3 factors. Considering that the same result was obtained under both methodologies, three factors were chosen for this study.

2.3.2 Flagging

Table 3 Cumulative Communalities Matrix

| Respondent | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 | Factor 6 | Factor 7 | Factor 8 |
|--|----------|----------|----------|----------|----------|----------|----------|----------|
| Stakeholder 1-NGO1 | 0,2682 | 0,7638 | 0,7642 | 0,7643 | 0,9343 | 0,9623 | 0,9648 | 0,9999 |
| Stakeholder 2-Private Sector1 | 0,0041 | 0,6548 | 0,6636 | 0,7468 | 0,9275 | 0,9389 | 0,9996 | 1,0001 |
| Stakeholder 3- NGO2 | 0,4585 | 0,507 | 0,8118 | 0,8585 | 0,9037 | 0,9256 | 0,9975 | 1 |
| Stakeholder 4- Private Sector2 | 0,2576 | 0,4874 | 0,6563 | 0,8859 | 0,9461 | 0,9656 | 0,9821 | 0,9999 |
| Stakeholder 5- Private Sector3 | 0,0947 | 0,7607 | 0,8507 | 0,8596 | 0,8668 | 0,9312 | 0,9803 | 1 |
| Stakeholder 6-NGO3 | 0,3795 | 0,3979 | 0,4174 | 0,769 | 0,9671 | 0,9943 | 0,9965 | 1 |
| Stakeholder 7- NGO4 | 0,6418 | 0,6629 | 0,7322 | 0,854 | 0,8574 | 0,9708 | 0,9714 | 0,9999 |
| Stakeholder 8- Private Sector4 | 0,2279 | 0,2314 | 0,8048 | 0,8127 | 0,8129 | 0,9918 | 0,9993 | 1 |
| Cumulative % explained variance | 29 | 56 | 71 | 82 | 90 | 96 | 99 | 100 |

Source: Own elaboration

The *Cumulative Communalities Matrix* enabled to identify how each factor best represents the ideas of each participant. Flagging allows the identification of what the factors will be based. Thanks to Ken Q's analysis, Auto-flagging could be carried out automatically, allowing to group individuals who share certain points of view. The result is the following matrix:

Table 4 Factor Matrix with Defining Sorts Flagged

| No. | Respond. | FG | Ftr 1 | flag | Ftr 2 | flag | Ftr 3 | flag | h ² |
|------------|--------------------------------|------|---------|-------------------------------------|----------|-------------------------------------|----------|-------------------------------------|----------------|
| 8 | Stakeholder 8- Private Sector4 | F1-1 | 0.86922 | <input checked="" type="checkbox"/> | -0.01929 | <input type="checkbox"/> | -0.221 | <input type="checkbox"/> | 0.80476 |
| 7 | Stakeholder 7- NGO4 | F1-2 | 0.75871 | <input checked="" type="checkbox"/> | -0.03821 | <input type="checkbox"/> | 0.39388 | <input type="checkbox"/> | 0.73224 |
| 6 | Stakeholder 6-NGO3 | F1-3 | 0.54008 | <input checked="" type="checkbox"/> | -0.02169 | <input type="checkbox"/> | 0.35389 | <input type="checkbox"/> | 0.41739 |
| 5 | Stakeholder 5- Private Sector3 | F2-1 | 0.03217 | <input type="checkbox"/> | 0.91663 | <input checked="" type="checkbox"/> | -0.09733 | <input type="checkbox"/> | 0.85072 |
| 1 | Stakeholder 1-NGO1 | F2-2 | 0.34756 | <input type="checkbox"/> | -0.79989 | <input checked="" type="checkbox"/> | 0.05999 | <input type="checkbox"/> | 0.76422 |
| 2 | Stakeholder 2-Private Sector1 | F2-3 | 0.14883 | <input type="checkbox"/> | 0.75154 | <input checked="" type="checkbox"/> | 0.27678 | <input type="checkbox"/> | 0.66357 |
| 3 | Stakeholder 3- NGO2 | F3-1 | 0.09879 | <input type="checkbox"/> | 0.12126 | <input type="checkbox"/> | 0.88729 | <input checked="" type="checkbox"/> | 0.81176 |
| 4 | Stakeholder 4- Private Sector2 | F3-2 | 0.09058 | <input type="checkbox"/> | 0.20147 | <input type="checkbox"/> | 0.77949 | <input checked="" type="checkbox"/> | 0.6564 |
| % Expl Var | | | 22 | | 26 | | 23 | | |

Source: Own elaboration

For example, Factor 1 brings together “Stakeholder 6-NGO3”, “Stakeholder 7- NGO4”, “Stakeholder 8- Private Sector4” who thought in a fairly similar way. While Factor 2 brings together “Stakeholder 5- Private Sector3”, “Stakeholder 2-Private Sector1” who thought in a fairly similar way and “Stakeholder 1-NGO1” who thought the opposite of the “Stakeholder 5- Private Sector3”, and “Stakeholder 2-Private Sector1”. It is observed that out of 3 factors, 1 are bipolar (Stakeholder1-NGO1 with -0.79). This step allows for establishing more correlations between the individuals.

2.3.3 Constitution of the synthetic Q-sort

It is now possible to reconstitute the synthetic Q-sorts that represent the synthesis of the respondents' views for each factor. To interpret the results obtained, it is necessary to understand the link between the statements and the different places they occupy in each factor. Thus, three factors have been identified, the name of each factor was chosen considering the collective thoughts of each group that auto-flagging has provided. whose importance will be explained in the following section:

- **Factor 1: Strategic and Innovative stakeholders**
- **Factor 2: Environmentally conscious stakeholders**
- **Factor 3: Environmental management stakeholders**

2.4 PROCESSING AND ANALYSIS OF RESULTS

2.4.1 Z-scores analysis

The Z-scores will allow identifying if, among the assertions that are in the same position, there are still differences. Indeed, as a search for intersubjectivity, the points of view must be shared. However, an individual's vision can be extremely helpful in the construction of a factor, in which case more weight will be given to what he or she tells in the interpretation of the factors. The Z-score is, therefore, more precise than the Q-sort.

These results shed light on how individuals view the most important green skills in a green transition.

Table 5 Factor Scores with Corresponding Ranks

| Statement Number | Factor 1 | Factor 1 | Factor 2 | Factor 2 | Factor 3 | Factor 3 |
|------------------|----------|----------|----------|----------|----------|----------|
| | Z-score | Rank | Z-score | Rank | Z-score | Rank |
| 1 | 1,27 | 2 | 0,16 | 7 | 1,8 | 1 |
| 2 | 0,53 | 5 | 0,33 | 6 | 1,51 | 2 |
| 3 | 0,41 | 6 | 1,66 | 2 | -0,61 | 12 |
| 4 | 0,24 | 7 | -0,87 | 12 | -0,29 | 7 |
| 5 | 0,69 | 4 | 0 | 8 | -0,29 | 8 |
| 6 | 1,72 | 1 | -0,21 | 9 | 1,19 | 3 |
| 7 | 0,16 | 8 | 0,5 | 5 | -0,58 | 11 |
| 8 | 1,14 | 3 | -1,12 | 13 | -1,8 | 15 |
| 9 | -0,86 | 11 | -0,54 | 11 | 0,29 | 6 |
| 10 | -1,43 | 15 | 1,83 | 1 | -0,61 | 13 |
| 11 | -1,27 | 13 | -1,24 | 14 | -0,29 | 9 |
| 12 | -1,39 | 14 | 0,75 | 3 | 0,61 | 4 |
| 13 | -0,86 | 12 | -1,5 | 15 | 0,61 | 5 |
| 14 | -0,24 | 10 | 0,75 | 4 | -1,22 | 14 |
| 15 | -0,12 | 9 | -0,5 | 10 | -0,32 | 10 |

Source: Own elaboration

These correlations are estimated by z-scores which are then converted to the values used in the agreement and disagreement scale, which range between -2 and +2, and thus each factor can be represented in a Q-sorts archetype. The 3 main discourses identified by Factors 1, 2, and 3 are very different. We can see in *the table 6* that the most important statements which define the first discourse are related to the *Innovation Skills* and the *strategic and leadership skills*. The second discourse stresses the importance of *Knowledge in environmental impacts assessment* and *Knowledge in the management of natural* as well as *Knowledge in waste management*. The last discourse is defined by *Strategic and leadership skills*, *Technical skills*, and *Innovation skills*.

2.4.2 Analysis of what distinguishes each factor and builds consensus

The table below distinguishes between the more or less agreed statements. Thus, it can be seen that there is only one statement on which there is unanimity among all the factors. For all three factors, *Knowledge in corporate social responsibility* generates neutral opinions about its importance in terms of green transition. This neutrality also exists for factors 2 and 3 in relation to *Risk management skills*, while for factor 1 it is more important.

Table 6 Factor Q-sort Values for Statements sorted by Consensus vs. Disagreement

| Statement Number | Factor 1 | Factor 2 | Factor 3 | Z-Score Variance |
|------------------|----------|----------|----------|------------------|
| 15 | 0 | 0 | 0 | 0,023 |
| 5 | 1 | 0 | 0 | 0,171 |
| 7 | 0 | 1 | -1 | 0,203 |
| 4 | 0 | -1 | 0 | 0,206 |
| 11 | -1 | -2 | 0 | 0,207 |
| 9 | -1 | -1 | 0 | 0,233 |
| 2 | 1 | 0 | 2 | 0,269 |
| 1 | 2 | 0 | 2 | 0,467 |
| 14 | 0 | 1 | -2 | 0,649 |
| 6 | 2 | 0 | 1 | 0,661 |
| 13 | -1 | -2 | 1 | 0,782 |
| 3 | 0 | 2 | -1 | 0,867 |
| 12 | -2 | 1 | 1 | 0,957 |

| | | | | |
|----|----|----|----|-------|
| 8 | 1 | -1 | -2 | 1,587 |
| 10 | -2 | 2 | -1 | 1,913 |

Source: Own elaboration

2.5 FACTORS INTERPRETATION

The aim of this section is to clarify the meaning of the archetypal factors constituting the different obtained discourses. To facilitate the reading of the discourse, all statements of each archetype Q-sort have been placed on their respective boxes of their respective pyramidal grid. The identified factors allowed us to distinguish 3 groups of stakeholders within the sample, and it has been named: **Strategic and Innovative stakeholders, Environmentally conscious stakeholders, and Environmental management stakeholders.**

2.5.1 Idealized Q-Sort for Factor 1. Strategic and innovative stakeholders

Figure 1 Idealized Q-Sort for Factor 1

| -2 | -1 | 0 | 1 | 2 |
|--|---|---|---|---|
| 10. 10. Knowledge in environmental impacts assessment to identify and reduce potential impacts for my activity on the environment. | 11. 11. Knowledge in public Policy Analysis skills for the efficient implementation of public policies in the development of the company. | 14. 14. Knowledge of Environmental laws to ensure the protection of the environment and the respect of the regulations and legislation. | 2. 2. Technical skills to favor adoption of green-clean technology to learn and apply the new technologies and processes required to green their jobs. | 1. 1. Strategic and leadership skills: to enable companies to set the right incentives and create conditions conducive to green business |
| 12. 12. Knowledge in waste management to reduce and valorize the waste generated by my economic activity | 13. 13. Knowledge in Life Cycle Analysis for the environmental evaluation of all stages of existence of a product, process, or economic activity. | 15. 15. Knowledge in Corporate Social Responsibility to evaluate the integration that each organization has with the environment in which it operates and with the society of which it is a part. | 5. 5. Risk management skills: to identify, analyze and respond to risk factors throughout the life of a project and control possible future costs and events such as a green transition | 6. 6. Innovation skills: to identify new opportunities and create strategies to respond to market demands and to a green or low-carbon transition policy. |
| | 9. 9. Teamwork skills reflecting the need for organizations to work collectively on tackling their environmental footprint. | 7. 7. Marketing and Consulting skills to promote greener products and services and advise consumers about green solutions. | 8. 8. Networking, IT (Information Technology) and language skills to introduce the benefits of our business or service on a global level and to find new collaborators, partners, and investors | |
| | | 4. 4. Analytical thinking- statistics and data analysis skills to assess, interpret and understand both the need for change and the measures required. | | |
| | | 3. 3. Knowledge in management of natural resources for the correct use of natural resources, their exploitation, conservation, and restoration. | | |

This figure shows the archetype of the respondents' opinions associated with Factor 1. On the right-hand side are the statements which the respondents generally agreed with, and on the left-hand side are the statements which the respondents disagreed with. This group has been named the **Strategic and innovative stakeholders** because they support more *The Strategic and leadership skills and Innovation skills*. This group also prioritizes the *Networking, IT and language skills* rather than the *knowledge in waste management and Knowledge in environmental impacts*. This group is the prevailing one and explains 29 % of the variance.

Factor 1 is composed by the following stakeholders:

- *Stakeholder 6-NGO3*
- *Stakeholder 7- NGO4*
- *Stakeholder 8- Private Sector4*

2.5.2 Idealized Q-Sort for Factor 2. Environmentally conscious stakeholders

Figure 2 Idealized Q-Sort for Factor 2

| -2 | -1 | 0 | 1 | 2 |
|---|---|---|---|---|
| 13. 13. Knowledge in Life Cycle analysis for the environmental evaluation of all stages of existence of a product, process, or economic activity. | 8. 8. Networking, IT (Information Technology) and language skills to introduce the benefits of our business or service on a global level and to find new collaborators, partners, and investors | 15. 15. Knowledge in Corporate Social Responsibility to evaluate the integration that each organization has with the environment in which it operates and with the society of which it is a part. | 7. 7. Marketing and Consulting skills to promote greener products and services and advise consumers about green solutions. | 3. 3. Knowledge in management of natural resources for the correct use of natural resources, their exploitation, conservation, and restoration. |
| 11. 11. Knowledge in public Policy Analysis skills for the efficient implementation of public policies in the development of the company. | 4. 4. Analytical thinking- statistics and data analysis skills to assess, interpret and understand both the need for change and the measures required. | 6. 6. Innovation skills: to identify new opportunities and create strategies to respond to market demands and to a green or low-carbon transition policy. | 14. 14. Knowledge of Environmental laws to ensure the protection of the environment and the respect of the regulations and legislation. | 10. 10. Knowledge in environmental impacts assessment to identify and reduce potential impacts for my activity on the environment. |
| | 9. 9. Teamwork skills reflecting the need for organizations to work collectively on tackling their environmental footprint. | 5. 5. Risk management skills: to identify, analyze and respond to risk factors throughout the life of a project and control possible future costs and events such as a green transition | 12. 12. Knowledge in waste management to reduce and valorize the waste generated by my economic activity | |
| | | 1. 1. Strategic and leadership skills: to enable companies to set the right incentives and create conditions conducive to green business | | |
| | | 2. 2. Technical skills to favor adoption of green-clean technology to learn and apply the new technologies and processes required to green their jobs. | | |

Factor 2 has been used to identify the second group of stakeholders named ***Environmentally conscious stakeholders***. The archetype of statements is represented in the figure below. twenty-seven percent of the variance is explained by this group of stakeholders.

Representatives of this group strongly agree that the *knowledge in the management of natural resources* and *Knowledge in environmental impacts assessment* is fundamental green skills for the green transition. They also emphasize the *Knowledge of environmental laws* and *Knowledge in waste management*. Moreover, the stakeholders' representatives in this group believe that the *Knowledge in public policy analysis* and *Knowledge in life cycle analysis* are not relevant to the transition.

Factor 2 is composed by the following stakeholders:

- *Stakeholder 1-NGO1*
- *Stakeholder 2-Private Sector1*
- *Stakeholder 5- Private Sector3*

2.5.3 Idealized Q-Sort for Factor 3 Environmental management stakeholders

Figure 3 Idealized Q-Sort for Factor 3

| | | | | |
|---|---|---|---|--|
| 8. 8. Networking, IT (Information Technology) and language skills to introduce the benefits of our business or service on a global level and to find new collaborators, partners, and investors | 10. 10. Knowledge in environmental impacts assessment to identify and reduce potential impacts for my activity on the environment. | 15. 15. Knowledge in Corporate Social Responsibility to evaluate the integration that each organization has with the environment in which it operates and with the society of which it is a part. | 13. 13. Knowledge in Life Cycle analysis for the environmental evaluation of all stages of existence of a product, process, or economic activity. | 2. 2. Technical skills to favor adoption of green-clean technology to learn and apply the new technologies and processes required to green their jobs. |
| 14. 14. Knowledge of Environmental laws to ensure the protection of the environment and the respect of the regulations and legislation. | 3. 3. Knowledge in management of natural resources for the correct use of natural resources, their exploitation, conservation, and restoration. | 4. 4. Analytical thinking- statistics and data analysis skills to assess, interpret and understand both the need for change and the measures required. | 12. 12. Knowledge in waste management to reduce and valorize the waste generated by my economic activity | 1. 1. Strategic and leadership skills: to enable companies to set the right incentives and create conditions conducive to green business |
| | 7. 7. Marketing and Consulting skills to promote greener products and services and advise consumers about green solutions. | 11. 11. Knowledge in public Policy Analysis skills for the efficient implementation of public policies in the development of the company. | 6. 6. Innovation skills: to identify new opportunities and create strategies to respond to market demands and to a green or low-carbon transition policy. | |
| | | 5. 5. Risk management skills: to identify, analyze and respond to risk factors throughout the life of a project and control possible future costs and events such as a green transition | | |
| | | 9. 9. Teamwork skills reflecting the need for organizations to work collectively on tackling their environmental footprint. | | |

Respondents who constitute the third group explain 15% of the variance and are very similar to the first group. They have been named ***Environmental management stakeholders*** because they strongly agree with the statement *Technical skills* and, they are agreed with the importance of the *Knowledge in Life Cycle analysis* and the *knowledge in waste management*. At the other extreme, *Knowledge of environmental laws* and *Networking, IT and language skills* are not important skills for the green transition.

Factor 3 is composed by the following stakeholders:

- *Stakeholder 3- NGO2*
- *Stakeholder 4- Private Sector2*

According to the ILO (2019), skill gaps and shortages are likely to be widespread, especially in low-income countries, which may create constraints on the transition to *a green economy*. In this regard, and in line with the proposed objectives of the GreenCap project to provide



support to Cambodian Higher Education Institutions to reform their curriculum for green growth, and so that these institutions can produce skilled labor according to the demand of Cambodian stakeholders. The identification of the main skills needed was carried out.

The results obtained using the Q methodology and regarding the opinions of stakeholders', concerning green skills towards a green transition in Cambodia three groups were identified: The first one was "*The Environmental management stakeholders*", who considered as important *Innovation skills, Networking, IT, and language skills*. The second group was "*The Environmentally conscious stakeholders*", who considered as important "Knowledge in environmental impacts assessment" and "Knowledge in management of natural resources". The Third group was "*The Strategic and innovative stakeholders*" who considered as important "*Strategic and leadership skills*" and, finally, "*Technical skills*".

CONCLUSIONS

It is important to note that the construction of scenarios for a green transition encountered difficulties in terms of the quantity and reliability of data on the green economy, green sectors, green and decent jobs, to assess the impact of climate change and climate-related policies on social inclusion in Cambodia and some Asia-Pacific countries.

For future research and internships, better data on green and decent jobs are needed to assess the impact of climate change and climate-related policies on social inclusion. Without better data, it will be difficult to determine what policy changes are needed to ensure a just transition to environmental sustainability and to analyse progress. An example of this limit has been that at first, we tried to measure the number of jobs according to the method of the Input-Output Tables. When we found that the data provided were not reliable and presented errors, we could not calculate the intersectoral relationship; we also looked for the database that would show the levels of CO₂ emissions of each sector to build the matrix with environmental extension and this was not possible as well.

According to the ILO (2019), skill gaps and shortages are likely to be widespread, especially in low-income countries, which may create constraints on the transition to a *green economy*. In this regard, and in line with the proposed objectives of the GreenCap project to provide support to Cambodian Higher Education Institutions to reform their curriculum for green growth, and so that these institutions can produce skilled labor according to the demand of Cambodian stakeholders. The identification of the main skills needed was carried out. The results obtained using the Q methodology and regarding the opinions of stakeholders', three groups were identified: The first one was "*The Environmental management stakeholders*", who considered as important *Innovation skills* (Statement 6), *Networking, IT, and language skills* (statement 8). The second group was "*The Environmentally conscious stakeholders*", who considered as important "Knowledge in environmental impacts assessment" (Statement 10) and "*Knowledge in management of natural resources*". The Third group was " *The Strategic and innovative stakeholders*" who considered as important "Strategic and leadership skills (statement 1)" and, finally, "*Technical skills* (statement 2)".



Due to the global crisis of the COVID-19 pandemic, the application of the survey had to be done via email and using “Q-Software” software. The use of this software allowed the stakeholders to complete the survey remotely. This was a limit to the development of this investigation due to language barriers and not being able to translate this questionnaire into the Cambodian language Khmer, and especially to answer the requests of the respondents instantly.

GLOSSARY

- **Climate Change:** *Climate change refers to a broad range of global phenomena created mainly by the burning of fossil fuels, which add heat-trapping greenhouse gases to the Earth's atmosphere. These phenomena include increased temperature trends (global warming), sea level rises, ice mass losses, and extreme weather events. (ILO, 2017b)*
- **Decent Work:** *Opportunities for women and men to obtain decent and productive work in conditions of freedom, equity, security, and human dignity, in which women and men have access on equal terms. (ILO, 2019)*
- **Energy Mix:** *The energy mix is a group of different primary energy sources from which secondary energy for direct use, such as electricity is produced. (Total Foundation, 2015)*
- **Greenhouse Gas Emissions (GHGs):** *Greenhouse gases are gases such as carbon dioxide or methane that trap heat and make the planet warmer. A large share of these gases are produced through human activities such as the burning of fossil fuels for electricity or for transport, for example (ILO, 2017b)*
- **Green Business:** *A green business is a business that produces/provides an environmentally friendly product/service or uses an environmentally friendly process, or both. Green businesses thus help to protect and restore the environment, while generating profit for the owner. (ILO, 2017b)*
- **Green Jobs:** *Green jobs are decent jobs that contribute to preserving or restoring the environment. Green jobs can be found in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency. (ILO, 2018)*
- **Green Skills:** *The skills needed by the workforce, in all sectors and at all levels, in order to help the adaptation of the products, services and processes to the changes due to climate change and to environmental requirements and regulations. (Martinez-Fernandez, Ranieri, & Sharpe, 2013)*
- **Green technology/clean technology:** *Technology that improves the resource or energy efficiency of production, ultimately to sustainable levels, reduces waste and/or increases the use of non-polluting, renewable resources. (ILO, 2019)*

- **Green Transition:** *Transition to environmentally sustainable economies and societies. The process of reconfiguring businesses and infrastructure to deliver better returns on investments of natural, human, and economic capital, while at the same time reducing greenhouse gas emissions, extracting and using fewer natural resources, creating less waste and reducing social disparities. (ILO, 2019)*
- **Q- Methodology:** *This methodology is often used to study or identify the opinions or perceptions of individuals concerning a phenomenon, problem, issue, or topic (Brown, (1996)). The objective of this method is to measure the subjectivity of individuals through different statements or declarations that individuals classified according to their point of view (Brown S. , 1986).*
- **Renewable Resources:** *Renewable resources are resources that can be replenished naturally, usually in a short period of time. For example, solar energy is a renewable energy source because it replenishes naturally in a short period of time, while crude oil, natural gas, coal and uranium (nuclear energy) are non-renewable sources of energy as they do not form or replenish naturally in a short period of time. (ILO, 2017b)*
- **Sustainable Development:** *Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The concept of sustainable development includes three components – economic development, social development and environmental protection – as interdependent and mutually reinforcing pillars. (ILO, 2015)*
- **Sustainable Development Goals (SDGs):** *in 2015 the 2030 Agenda for Sustainable Development (2030 Agenda) was adopted by all UN member States. The 17 SDGs constituted an urgent call for global action in ending poverty, improving health and education, reducing inequalities, catalyzing economic growth, and tackling climate change in both developed and developing countries. (Sustainable Development Knowledge Platform: <https://sustainabledevelopment.un.org/sdgs>).*
- **Stakeholders:** *People or small groups with the power to respond to, negotiate with, and change the strategic future of the organization. (Eden & Ackermann, 1998)*



BIBLIOGRAPHY

- Asian Development Bank (ADB). (2018). *Sector-wide Evaluation: ADB's Support for the Agriculture, Natural Resources, and Rural Development*. ADB's Independent Evaluation.
- Barry, J., & Proops, J. (1999). *Seeking sustainability discourses with Q methodology*. Ecological economics.
- Bowen, A., Duffy, C., & Fankhauser, S. (2016). *'Green growth' and the new industrial revolution*. LSE Working Paper.
- Brown, S. (1980). *Political subjectivity : Applications of Q methodology in political science*. New Heaven: Yale University Press.
- Brown, S. (1986). *The history and principles of Q-methodology in psychology and the social sciences*. Retrieved from <<http://fac-staff.uww.edu/cottlec/QArchive/Bps.htm>>
- Brown, S. (1993). *A Primer on Q Methodology*. Retrieved from https://www.researchgate.net/profile/Steven_R_Brown/publication/244998835_A_Primer_on_Q_Methodology/links/54749d440cf2778985abeb8e/A-Primer-on-Q-Methodology.pdf
- Brown, S. (1996). Q Methodology and Qualitative Research. *Qualitative Health Research*, 6(4).
- Bureau of Labor Statistics, United States Department of Labor. (2017). BLS (Bureau of Labor Statistics, United States Department of Labor). *National Agricultural Workers Survey*. Retrieved from National Agricultural Workers Survey.
- Cattell, R. (1965). *Factor analysis: An introduction to essentials I. The purpose and underlying models*. Biometrics 21.
- Cedefop. (2012). *Green Skills and Environmental Awareness in Vocational Education and Training. Synthesis report*. Greece: Cedefop.
- Eden, C., & Ackermann, F. (1998). *Analysing and comparing idiographic causal maps. Managerial and organizational cognition: Theory, methods and research*. London: Sage.
- Ellen MacArthur Foundation . (2013). *Towards The Circular Economy-Economic and Business Rationale for an Accelerated Transition*. Ellen MacArthur Foundation.
- European Commission. (2013). *Promoting green jobs throughout the crisis: A handbook of best practices in Europe*. Brussels: European Commission.
- Eurostat. (2020). *Glossary:Environmental goods and services sector (EGSS)*. Retrieved from Eurostat Statistics-Explained: [https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Environmental_goods_and_services_sector_\(EGSS\)](https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Environmental_goods_and_services_sector_(EGSS))
- Food and Agriculture Organization of the United Nations. (2011). *Save and grow: A policymaker's guide to the sustainable intensification of smallholder crop production*. Rome: FAO.
- Gauzente, C. (2005). *La Méthodologie Q et l'étude De La Subjectivité*. De Boeck Supérieur. Retrieved from <https://www.cairn.info/management-des-ressources-humaines---page-177.htm>
- GGGI. (2018). *Green Growth Potential Assessment: Cambodia Country Report*. Global Green Growth Institute (GGGI).
- ILO. (2011). *Skills for Employment Policy Brief: GREENING THE GLOBAL ECONOMY THE SKILLS CHALLENGE*. Geneva: International Labour Organization.
- ILO. (2012). *Working towards sustainable development : opportunities for decent work and social inclusion in a green economy*. Geneva: International Labour Office.
- ILO. (2013). *Methodologies for assessing Green Jobs*. Geneva: International Labour Organization.
- ILO. (2015). *Anticipating skills needs for green jobs: A practical guide*. Geneva: International Labour Office.
- ILO. (2016a). *Green Jobs: Progress Report 2014-2015*. Geneva: International Labor Office.



- ILO. (2016b). *World Employment and Social Outlook 2016: Transforming jobs to end poverty*. Geneva.
- ILO. (2017b). *Green Business Booklet*. Geneva: International Labour Office.
- ILO. (2018). *World Employment and Social Outlook 2018: Greening with jobs*. Geneva: International Labour Office.
- ILO. (2019). *Skills for a greener future: A global view based on 32 country studies*. Geneva: International Labour Office.
- ILO Regional Office for Asia and the Pacific. (2014b). *Green jobs mapping study in Malaysia*. Bangkok: ILO Regional Office for Asia and the Pacific.
- ILO Regional Office for Asia and the Pacific. (2019b). *Cambodia: Employment and Environmental Sustainability Fact Sheets*. ILO Regional Office for Asia and the Pacific.
- KEI. (2018). *Environmental Sustainability in Asia : Progress, Challenges and Opportunities in the Implementation of the Sustainable Development Goals Series 2 - Cambodia*. Sejong, Korea.: Korea Environment Institute.
- Martinez-Fernandez, C., Ranieri, A., & Sharpe, S. (2013). *"Greener Skills and Jobs for a Low-Carbon Future"*. Paris: OECD Green Growth Papers, 2013-10, OECD Publishing.
- Meidinger, E. C. (2003). *"THE FUNDAMENTALS OF FOREST CERTIFICATION"*. Social and Political Dimensions of Forest.
- OECD . (2019). *OECD Skills Strategy 2019: Skills to Shape a Better Future*. Paris : OECD Publishing.
- Onemev. (2019). *Rapport d'activité 2018*. Observatoire national des emplois et métiers de l'économie verte.
- Paris Agreement. (2015, Dec. 12). The Paris Agreement. Retrieved from Available at: https://unfccc.int/files/meetings/paris_
- Slaper, T., & Krause, R. (2009). *The green economy: What does green mean?* Indiana Business Review, Fall.
- Stephenson, W. (1953). *The study of behavior; Q-technique and its methodology*. . University of Chicago Press.
- The Royal Government of Cambodia (RGC). (2017). *The National Environment Strategy and Action Plan (NESAP) 2016-2023*.
- The World Bank. (2015). *CAMBODIAN AGRICULTURE IN TRANSITION: OPPORTUNITIES AND RISKS*. Washington : The International Bank for Reconstruction and Development / The World Bank.
- Total Foundation. (2015). *Planete Energies*. Retrieved July 2020, from <https://www.planete-energies.com/en/medias/close/what-energy-mix>
- Vira, B., & Dasgupta, P. (2005). *"Q Methodology" for Mapping Stakeholder Perceptions In Participatory Forest Management*. UK Department for International Development (DFID).
- Webler, T., Danielson, S., & Tuler, S. (2009). *Using Q Method to Reveal Social Perspectives in Environmental Research*. Social and Environmental Research Institute.
- World Bank. (2017). *Cambodia: Sustaining strong growth for the benefit of all*.
- World Bank Group. (2019). *CAMBODIA ECONOMIC UPDATE- Recent economic Development* .

APPENDICES

Appendix 1: List of statements for the Q Methodology survey

| State Number | Statement |
|--------------|---|
| 1 | Strategic and leadership skills: to enable companies to set the right incentives and create conditions conducive to green business |
| 2 | Technical skills to favor adoption of green-clean technology to learn and apply the new technologies and processes required to green their jobs. |
| 3 | Knowledge in management of natural resources for the correct use of natural resources, their exploitation, conservation, and restoration. |
| 4 | Analytical thinking- statistics and data analysis skills to assess, interpret and understand both the need for change and the measures required. |
| 5 | Risk management skills: to identify, analyze and respond to risk factors throughout the life of a project and control possible future costs and events such as a green transition |
| 6 | Innovation skills: to identify new opportunities and create strategies to respond to market demands and to a green or low-carbon transition policy. |
| 7 | Marketing and Consulting skills to promote greener products and services and advise consumers about green solutions. |
| 8 | Networking, IT (Information Technology) and language skills to introduce the benefits of our business or service on a global level and to find new collaborators, partners, and investors |
| 9 | Teamwork skills reflecting the need for organizations to work collectively on tackling their environmental footprint. |
| 10 | Knowledge in environmental impacts assessment to identify and reduce potential impacts for my activity on the environment. |
| 11 | Knowledge in public Policy Analysis skills for the efficient implementation of public policies in the development of the company. |
| 12 | Knowledge in waste management to reduce and valorize the waste generated by my economic activity |
| 13 | Knowledge in Life Cycle analysis for the environmental evaluation of all stages of existence of a product, process, or economic activity. |
| 14 | Knowledge of Environmental laws to ensure the protection of the environment and the respect of the regulations and legislation. |
| 15 | Knowledge in Corporate Social Responsibility to evaluate the integration that each organization has with the environment in which it operates and with the society of which it is a part. |

Source: Own elaboration

[illegible]

Source: Own elaboration